

## Appendix I

### Special Studies Related to Toxics – MY2006

This Appendix presents brief summaries of some of the toxics-related Special Studies initiated and/or performed in each DEQ Regional Office's jurisdiction during Monitoring Year 2006. Complete Quality Assurance Project Plans for each Special Study may be found in the DEQ CEDS 2000 database, or requested from the Regional Office Monitoring Coordinator of the appropriate DEQ Region.

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# Northern Virginia Regional Office (NVRO)

## Regional Office Monitoring Coordinator

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1. In cooperation with the U.S. Army Corps of Engineers, Norfolk District, the Lake Anna Civic Association and other partners, NVRO has conducted monitoring to investigate sources of PCB's and characterize potential metals contamination in Lake Anna. Metals sampling focused on the Contrary Creek arm of the lake while low-detection level PCB sampling has considered the entire reservoir. Sediment sampling and water column sampling through the use of semi-permeable membrane devices (SPMDs) was conducted throughout the lake and selected stream tributaries in the summer and fall of 2004. This effort, in conjunction with fish tissue data, was designed to identify regions of the lake exhibiting elevated PCB levels. The highest PCB levels were found to be in the Pamunkey Creek and Terrys Run arms of the lake. Extensive sediment sampling was conducted in the summer of 2005 as a follow-up to the initial sampling event. The extensive grid sampling approach in 2005 focused on the Pamunkey Creek and Terrys Run arms of the lake. In general, the highest PCB concentrations in sediment were discovered near bridge crossings. Monitoring activities in the summer of 2006 included limited sediment sampling on the Terrys Run arm of the lake and water column grab sampling during a storm event in September 2006. The water column sampling during the storm event seeks to understand relative PCB concentrations during high flow events versus normal lake pool levels. Data from the storm event sampling has not yet been analyzed.
2. Potomac River and Va. Tributary PCB TMDL (includes portions of the Piedmont Region): An interstate TMDL project involving Maryland, the District of Columbia, Virginia and the U.S. EPA was initiated in 2004 to investigate the severity, extend and probable sources of PCB contamination in the tidal Potomac River Basin. During the past year, water column grab sampling using low detection level analytical methods was conducted during base flow and storm flow events at selected tributaries to the Potomac River. Additionally, effluent sampling from identified significant wastewater treatment facilities was conducted using low detection level methods to evaluate PCB loadings from this source category. Effluent sampling was conducted using automated samplers to collect 24-hour composite samples from each of 11 facilities. The ambient stream and point source effluent samples were analyzed using EPA Method 1668, Revision A to determine congener specific PCB concentrations. The TMDL is scheduled for completion in September 2007. TMDL information can be found at the following website:  
<http://www.deq.virginia.gov/tmdl/mtgppt.html>
3. The acid mine drainage resulting from historical mining activities along Contrary Creek in Louisa County, Virginia has long been recognized as severely impairing the aquatic life of the stream. The stream is currently identified in the Clean Water Act §303(d) list for an aquatic life use impairment due to low pH. During the past year, clean metals testing was performed in the Contrary Creek watershed to understand the concentration of dissolved constituents in the water column. Three sampling events were performed during the course of the year. Sampling was performed along the entire length of the stream. This included testing of the Contrary Creek headwaters to measure background concentrations as well as testing into the inundated waters of Lake Anna to understand the extent of the zone exhibiting elevated levels of dissolved metals.
4. The Accotink Creek and Difficult Run watersheds are both located in Fairfax County, Virginia. Both streams are identified in the Clean Water Act §303(d) list for aquatic life use impairments due to impaired benthic macroinvertebrate communities. Benthic TMDLs for these streams are both scheduled to be completed in spring 2008. In preparation of TMDL development and evaluation of potential stressors to the benthic community, toxicity monitoring was performed in fall 2005. A chronic toxicity study using fathead minnows (*Pimephales promelas*) and *Ceriodaphnia dubia* was conducted on ambient water samples collected from both streams. The tests were performed to determine if water column toxicity is stressing the benthic community. The results of the testing were indeterminate for Accotink Creek. However, Difficult Run was found to be toxic to the *Ceriodaphnia*. DEQ is now formulating monitoring plans to further investigate potential water column toxicity in these streams, in addition to evaluating other potentials stressors to the benthic community.

# **Piedmont Regional Office (PRO)**

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### **1. Special Study of Mercury Source Assessment in the Dragon Swamp/Piankatank River – 2004-06**

#### **Problem Definition/Background**

Largemouth Bass collected in 2002 near the Route 17 Bridge on Dragon Swamp, exceeded the DEQ (EPA) screening value of 0.3 ppm for mercury. The VDH issued a health advisory in October 2003 covering Dragon Swamp and the Piankatank River from state Route 603 near Mascot, VA downstream to Deep Point boat Landing (State Rt. 606). DEQ is initiating this study to determine the magnitude and spatial extent of mercury contamination in this aquatic system and to begin the process of source identification and remediation.

As a result of the observed fish tissue contamination, the VDH recommended that people eat no more than two eight once meals of largemouth bass caught from these waters per month. This suggests a potential threat to human health upon which the Director may determine the need for a source assessment.

A 4.6 mile portion of this same segment was listed as impaired for fish consumption use in the 2002 303(d) Impaired waters list due to mercury tissue contamination and this segment will be expanded in the 2004 listing to include the entire area now under the VDH advisory. Therefore this project is consistent with the DEQ Toxic Contamination Source Assessment Policy (TCSAP, Jan. 5, 2000) which describes when and how to conduct source assessments for toxic contaminants. The circumstances above represent triggers listed in that document, which indicates the need for source assessment.

#### **Study Objectives**

The objective of this study is to further define the spatial extent and magnitude of the mercury contamination problem in this system through additional sampling of water, sediment and fish tissue. An additional objective will be to determine if some or all of this contamination is coming from local sources or if long-term transport of atmospheric mercury is a primary causative factor of this problem. A detailed analysis of the watershed and possible local sources, such as landfills (review of existing monitoring data from permit files), agricultural chemical use, wood preservation operations etc, and local (state) air emissions will be conducted. Water and sediment sampling of the entire watershed may indicate if some tributaries or areas are more heavily contaminated than others. Such patterns of contamination may indicate local sources of mercury.

#### **Work Schedule**

This project plan describes the first year's activity of the project, which will in all probability require several years of work by DEQ. The first year's activities will establish an interagency Hg task force (TF) convened by the Secretary of Natural Resources. This TF will help to formulate the plan for subsequent year's work. This first year plan will address initial sampling to further characterize the extent and magnitude of the problem and begin the source identification process. Subsequent years work, with the guidance of the TF will address the more complex issues of management of mercury contamination from atmospheric sources, both local and interstate.

#### **Proposed Work schedule:**

Task 1. February 2004 – Draft QAPP completed.

Task 2. March 2004 – Concurrence signatures on final draft QAPP.

Task 3. February-March 2004 – Conduct literature search, coordination with air monitoring and waste permitting staff. Begin review of existing monitoring well and leachate data from waste permit files (landfill in King and Queen Co.)

Task 4. April – May 2004 - Attend task force meetings to evaluate and guide source assessment project. This committee will be composed of concerned and technically informed citizens, scientists and staff from within state or local government.

Task 5. July 2004 – June 2005 – Office of Water Quality Standards sampling of fish tissue and sediments of selected locations to characterize spatial patterns of contamination distribution to determine if any areas or tributaries are more heavily contaminated and may indicate local point or non-point inputs of mercury. (Budgeted outside of this study.)  
Task 6. July 2004 – June 2005 – Piedmont Regional Office sampling of fish sediments of selected locations to characterize spatial patterns of contamination distribution to determine if any areas or tributaries are more heavily contaminated and may indicate local point or non-point inputs of mercury.  
Task 7. July 2005– December 2005 – Assess results of first year's data collection, meet with TF, determine plan for further actions in subsequent years and/or remediation steps. Repeat assessments of annual data and decide with TF input on subsequent years planning, budgeting, and sampling efforts. Draft and final reports completed.

**MY2006** – For the second year of this study, thirteen stream stations were sampled for total mercury on the same day during both high flow and low flow regimes, and the 'Mercury Deposition Network' station was continued in Harcum, VA, for atmospheric deposition data. To date, ambient water results continue to be far below water quality standards, and there appear to be no ambient point source hotspots in the basin. Atmospheric data for 2005 is undergoing interpretation at this time. This study will continue at least through June 2007 pending the availability of funding.

**2. Potomac River and Va. Tributary PCB TMDL** – PRO deployed and retrieved 8 SPMDs and obtained 5 sediment PCB samples in PRO Potomac tidal and non-tidal tributaries, the mainstem mouth of the Potomac and in Maryland's Wicomico River as a QAQC comparison with MD sample methods. The TMDL Project is now preparing to sample major point source dischargers. The only PRO discharger under consideration for sampling is the Town of Colonial Beach STP. This study will continue into 2006. A more complete description of this project is included in the Section relevant to the Northern Virginia Regional Office, which is responsible for most tidal Potomac River monitoring done in the state.

**MY2006:** PRO collected ambient PCB water samples from three Potomac River tributaries under base flow and high flow conditions. In addition, a single PCB effluent sample was collected from the Town of Colonial Beach STP. All samples were analyzed using EPA's high resolution, low detection method (1668A). These samples were in addition to SPMD and sediment samples collected early in 2005 for this project. The TMDL is due by September 2007.

**3. Special Study of Benthics in Spring Creek, Sussex County, VA** – Chowan River Basin (Waterbody VAP-K32R-02)

#### **Problem Definition/Background:**

A 35.2 mile segment of Spring Branch (waterbody ID VAP-K32R-02, Sussex Co.) from the Spurlock Adhesives discharge to the confluence with the Blackwater is listed as not supporting the aquatic life use due to the general standard for benthics.

The segment is considered impaired for the benthic community based on 4 biological monitoring stations. 5ASRN003.82 is the control station located upstream of all the discharges; 5ASRN003.69 is located 50 yards below the Route 460 bridge; 5ASRN001.24 is located 100 yards below the Town of Waverly Municipal STP discharge; and 5ASRN000.65 is located downstream of Bryant's Pond, near the mouth of Spring Branch. All the stations, with the exception of the control station upstream of the discharges, rated moderately to severely impaired. The source of the impairment of Spring Branch is unknown. There are one municipal discharge and two industrial discharges to the stream. There are also extensive sludge deposits, attributed to the old Waverly primary plant (it has been upgraded to secondary treatment), in Spring Branch and Bryant's Pond, 1/4 mile downstream of the Waverly STP discharge. Spring Branch is scheduled for development of a TMDL in 2006. In order to support the TMDL work, targeted monitoring is necessary to further delineate the extent of impairment and to characterize its causes and sources.  
DEQ Biological Monitoring History

Spring Branch was sampled for benthics Spring & Fall 1978-1997 at 4 stations. 5ASRN003.82 is the upstream control that was frequently dry, stagnant, or not much use as a good control station. 5ASRN003.69 is located at Rt. 460, immediately below Spurlock, Inc. cooling water discharge. This station was rated either moderately or severely impaired through the years due to Spurlock's runoff, spills, groundwater contamination, etc. The benthic community was always very sparse here with high conductivity. 5ASRN001.24 was 100 yds below Waverly STP. This was severely impaired due to poor STP performance and solids releases by the old STP. STP upgrades after 1992 improved the STP effluent but the swamp habitat prevented adequate solids flushing and decomposition. 5ASRN000.65 was located below the dam at Bryant's Pond. This was rated either moderately or severely impaired through the years due to long term discharges from Spurlock, Waverly STP, and Masonite. The pond created conditions that trapped/contained these past discharges which created numerous algae blooms, duck weed problems and fish kills through the years.

## DEQ Ambient Monitoring History

In addition to benthic monitoring at selected stations, the agency established a continued monitoring station, 5ASRN000.65, below the Route 613 Bridge in April 1973; the last sampling date was 08 November 2005 for a total of 86 visits. Another station is 5ASRN003.69, established in August 1971; the last sampling date was 08 November 2005 for a total of 221 visits. And finally station 5ASRN003.82 was established in April 1973; the last sampling date was 08 November 2005 for a total of 65 visits.

**MY2005-06 - Spring Branch Benthic TMDL** – Toxicity tests performed in November 2004 indicated significant toxicity in ambient water samples from Spring Branch. PRO performed VOC, semi-volatile organics, sediment organics, clean metals, and ammonia sampling, at a total cost of \$16,500, attempting to confirm EPA bioassay toxicity results from Spring Branch and locate a source. A suspected source is the former Borden Chemical facility. However, all organics results were below detection limits, clean metals were in normal ranges, and ammonia levels were not remarkable. Only occasional high levels of nitrate were found in a tributary to Spring Branch below the former Borden site. This study has continued into 2006. The TMDL was approved by EPA and the SWCB in 2006, with total phosphorus reductions as the TMDL endpoint. Post TMDL monitoring continues for nutrients, including ammonia.

## South Central Regional Office (SCRO)

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### Roanoke (Staunton) River PCB TMDL Source Assessment, Leesville dam to backwaters of Kerr Reservoir – 2005-06

SCRO began development of a monitoring plan to investigate sources of PCBs in the Roanoke (Staunton) River in order to develop a Total Maximum Daily Load. Monitoring was scheduled for late summer/early fall 2005. Sampling has included the use of semi-permeable membrane devices (SPMDs) and a high resolution-low detection level analysis method (1668A) to assess water column PCB concentrations throughout the river and selected stream tributaries, as well as effluent concentrations at selected facility outfalls. The TMDL is scheduled for completion in July 2006. A final report on the study should be available at that time.

A descriptive sampling and analysis plan for this study, submitted by Tetra Tech, Inc. (Tetra Tech, 2005) is available on the DEQ WebPages at <http://www.deq.virginia.gov/tmdl/pptpdf/roansap1.pdf>. Monitoring sites and activities proposed by DEQ are as follows:

Table 5.1 DEQ proposed monitoring stations

Station ID	Station Description	SPMD	Effluent	Ambient
Upper Roanoke Primary Stations				
4AROA227.42	Located approximately 0.26 miles downstream of the confluence of the North and South Forks of the Roanoke River. This station will provide information on possible PCB sources located on the North or South Forks. Co-located with USGS Gage Station-Lafayette, VA.	x		x
4AROA219.00	Located approximately 0.99 miles downstream of fish tissue and sediment station 4AROA219.99. Co-located with USGS Gage Station-Glenvar, VA.	x		x
4AROA215.13	Located in Salem City below Green Hill Park, above Mason's Creek.	x		
4AMSN000.67	Located near the mouth of Mason Creek, upstream of DEQ sediment and fish tissue station 4AMSN000.60 in the City of Salem. Depending on field evaluation this station maybe closer to the confluence of the	x		

Station ID	Station Description	SPMD	Effluent	Ambient
	Roanoke River.			
4APEE000.00	Located near the confluence of the Roanoke River. This station is below fish station 40PEE000.49 and the sediment and fish station 4APEE001.04. This station is below Roanoke Electric Steel and Shaffer's Crossing.	x		
4AROA207.08 Roanoke River downstream of Peters Creek	Located on the Roanoke River below Peters Creek. This station is located in the City of Roanoke This station is located upstream of Wasena Park near Memorial Bridge and below Evans Paint.	x		
Roanoke Electric Steel Corporation	Located on the Roanoke Electric Steel Corporation outfall. Facility located on the 2400 block of Patterson Ave SW near the riverfront in the City of Roanoke.		x	
Western Virginia Water Authority Regional WPCP	Located on the Western Virginia Water Authority Regional WPCP outfall. Facility located at 1402 Bennington St SE in the City of Roanoke.		x	
4AROA204.76	This station is located downstream of Ore Branch, near Virginia Scrap Iron Company and above American Viscose (now the Roanoke Industrial Park).	x		
4AROA202.20	Co-located with DEQ sediment and fish tissue station 4AROA202.20. This station is located below American Viscose and upstream of the Roanoke STP	x		
4ATKR000.69	Co-located with DEQ sediment and fish tissue station 4ATKR000.69. This station maybe moved closer to the confluence depending on field evaluation.	x		
4AROA200.06 Roanoke River downstream of Tinker Creek	Located on the Roanoke River below Tinker Creek and approximately 0.60 miles downstream of the Roanoke STP.	x		
Upper Roanoke Follow-up Stations				
Barnhardt Creek	Located at the mouth of Barnhardt Creek. This stream is a tributary to the Roanoke River, downstream of the Mason Creek confluence.			
Mud Lick Creek	Located at the mouth of Mud Lick Creek. This stream flows into the Roanoke River, upstream of the Peters Creek confluence			
Murray Run	Located at the mouth of Murray Run. This stream is a tributary to the Roanoke River, just upstream of the Ore Branch confluence			
Ore Branch	Located at the mouth of Ore Branch. This small stream flows through industrialized areas in the City of Roanoke			
Lick Run	Located at the mouth of Lick Run. This stream drains a large portion of the City of Roanoke, including several possible PCB source facilities and other sites.			
Tinker Creek Above City of Roanoke	Located on Tinker Creek north of the Roanoke City limits.			
Glade Creek	Located at the mouth of Glade Creek, near Walnut Avenue. This Tinker Creek tributary drains commercial/industrial areas in the City of Roanoke and the Town of Vinton.			
Middle Roanoke Primary Stations				
4AROA199.20	Located below Niagara Dam upstream of an old Roanoke County landfill. This station is co-located with DEQ fish tissue station 4AROA199.20 and USGS Gage Station-Niagra, VA., adjacent to the Blue Ridge Parkway in Roanoke County.	x		x
4AROA196.98	Located at Explore Park below the confluence with Back Creek. A <b>closed</b> Roanoke Regional landfill is located upstream of this station.	x		
Middle Roanoke Follow-up Stations				
Back Creek	Co-located with DEQ sediment station 4ABAA000.03, located near the mouth of Back Creek. The Roanoke Regional Landfill is located along Back Creek and contributes runoff to this sampling point.			
4ABWR019.75	Located on the Blackwater River where the backwaters of the Smith Mountain Lake Dam begin.			
4APGG003.29	Located on the Pigg River at the Route 605 bridge.			



Station ID	Station Description	SPMD	Effluent	Ambient
Lower Roanoke Primary Stations				
4AROA137.00 Below Leesville Lake Dam	Co-located with DEQ station 4AROA0137.00, just downstream of Goose Creek below the Leesville Lake Dam. The APCO Leesville Hydroelectric Plant is located at the dam site. Goose Creek includes several possible PCB source sites in the upper portion of its watershed. The upper and middle Roanoke River subwatersheds (including the Blackwater River and Pigg River) drain to this site.	x		
4AROA128.97 US of Altavista	Approximately co-located with existing DEQ sediment station 4AROA128.98. This station is located upstream of BGF Industries and several possible PCB sources in the Altavista/Hurt area.	x		
Burlington Industries LCC Hurt Plant	Located on the Burlington Industries outfall approximately 0.08 miles downstream of the Sycamore Creek Roanoke River confluence.		x	
4ALYH000.21 Lynch Creek	Located near the mouth of Lynch Creek in the Town of Altavista. DEQ sediment station 4ALYH000.02 was sampled in 1999 at the proposed location. This station will provide information on possible PCB sources located in the Lynch Creek watershed including: Blanks Exxon, Hardy Texaco, Watts Chevron, the Altavista oil distributor wet area, in addition to possibly capturing runoff from BGF Industries, A. O. Smith, and Schrader Bridgeport.	x		
4AROA128.94 Lane West Landfill	Located on the eastern bank of Lynch Creek in Altavista along the northern bank of the Staunton River. This landfill was originally scheduled to be monitored in the summer of 2000, according to Altavista/Hurt facility surveys, but was not sampled due to safety concerns.	x		
Altavista Town - Wastewater Treatment Plant	Located on the Altavista WTP outfall in the town of Altavista at the confluence of Reed Creek and the Roanoke River near Ricky Van Shelton Drive.			
Upstream of BGF Industries	Stormwater grab sample upstream of BGF Industries to isolate from stormwater flow through/around BGF site.			x
4AXLN000.05 X-trib of Roanoke (BGF)	Located on an unnamed tributary that flows through the BGF Industries site to the Staunton River.	x		
4AROA128.21 Lane East Landfill	Located on the northern bank of the Staunton River, near DEQ sediment station 4AXXZ000.05. This landfill was originally scheduled to be monitored in the summer of 2000, according to Altavista/Hurt facility surveys, but was not sampled due to safety concerns.	x		
4AROA125.59 DS of Altavista	Co-located with DEQ sediment and fish tissue station 4AROA125.59 on the Roanoke approximately 0.65 miles below the Big Otter River confluence. This station captures the runoff and flow from the facilities/sites located in the Altavista/Hurt area and will also provide information on possible contributions from the Big Otter River watershed.	x		
4ABOR000.62 Big Otter River at Route 712	Located approximately 0.62 miles upstream of the mouth of the Big Otter River. This station captures the runoff and flow from the facilities/sites located in the Big Otter River subwatershed.	x		
4AROA097.76 US of Brookneal	Located on the Staunton River approximately 0.70 miles upstream of DEQ sediment station 4AROA097.06. This location captures the runoff and flow from the portion of the watershed upstream of the Town of Brookneal.	x		
Dan River Inc. - Brookneal	Located on the Dan River Inc. outfall in the town of Brookneal near Corporation Branch and Mattox Street.		x	
4ACOR000.21 Corporation Branch	Located on Corporation Branch, which is a small tributary that flows through Brookneal to the Staunton River. Dan River Inc. is located along the tributary, directly upstream of the proposed sampling location.	x		
4AFRV002.78 Falling River DS of Brookneal STP at Route 40	Located approximately 0.34 miles downstream of DEQ sediment station 4AFRV003.12 near Route 40.	x		

Station ID	Station Description	SPMD	Effluent	Ambient
4AROA090.50 DS of Brookneal	Located on the Stanton River directly above the mouth of Catawba Creek. This location captures the runoff from possible PCB sources located in Brookneal, including Dan River Inc., the Town of Brookneal Staunton River Lagoon, and the Brookneal Hatchery.	x		
4AROA067.91 at Route 746 Scuffletown Road near Randolph	Co-located with DEQ sediment and fish tissue station 4AROA067.91 approximately 8.85 miles downstream of the Club Creek Roanoke River confluence. This location captures discharges from facilities located in the Keysville/Drakes Branch Virginia area.	x		x
4AROA059.12 at Route 92 Clover Road near Clover	Co-located with DEQ sediment and fish tissue station 4AROA059.12 approximately 5.33 miles downstream of the Horsepen Creek Roanoke River confluence. This location captures discharges from facilities located in the Clover Virginia area.			x

**MY2006:** The TMDL, which is scheduled for completion in 2008, is in response to PCB fish consumption advisories in the river. PCB sampling has included the use of semi-permeable membrane devices (SPMDs) deployed in areas that will help delineate sources of contamination. Ambient water samples were also collected at five stations, some co-located with USGS flow gages, during base and elevated flow conditions. These samples were analyzed using EPA Method 1668A which has high resolution-low detection level capabilities. Effluents from selected facility outfalls were also assessed for potential PCB loadings to the watershed using the low detection method. The PCB results are currently being reviewed.

A descriptive sampling and analysis plan for this study, submitted by Tetra Tech, Inc. (Tetra Tech, 2005) is available on the DEQ WebPages at <http://www.deq.virginia.gov/tmdl/pptpdf/roansap1.pdf>. The results of this study, which will be available in spring 2007, will provide information for future PCB sampling.

# Southwest Regional Office (SWRO)

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### 1. **Bluestone River PCB Source Investigation and Stakeholder Survey, Tazewell County, VA**

(<http://www.deq.virginia.gov/fishtissue/pdf/bluestonepcbid2002.pdf>)

**MY2005:** PCB's were recently found in fish in the Bluestone River at levels that prompted the Virginia Department of Health to issue a fish consumption advisory for the River. A survey of local stakeholders was initiated in the fall of 2004, to identify possible sources of the contamination. Semi-permeable Membrane Devices (SPMD) were used to sample PCB concentrations in the water column. Thus far, three rounds of SPMDs have been deployed in the Bluestone River watershed, both in Virginia and West Virginia, to further identify the extent of affected tributaries and TMDL loadings. A second round of fish tissue sampling has been conducted with assistance of the Virginia Game Commission. Additional information on this study and the final results from water column PCB sampling should be available for next year's Toxics Reduction Report.

**MY2006:** During low flow conditions semi-permeable membrane devices (SPMDs) were deployed in the fall of 2005 to further identify the extent of the PCB contamination problem. SPMD sampling devices were sent to the USGS laboratory for analysis. Results have not yet been received.

2. **North Fork Holston River, Mercury TMDL:** Olin Corporation continues to collect samples for the US Fish and Wildlife Service's (USF&WS) Natural Resources Damage Assessment. This data will subsequently be used in the development of the North Fork TMDL.
3. **Levisa Fork PCBs (TMDL):** A work plan has been developed to identify potential sources of PCBs and TMDL development. The study design shall include SPMDs and ambient water and effluent collection using a low level detection method (EPA 1668A). The study is planned for spring 2007.
4. **Benthic Impairment TMDLs sampled during FY 2006:**
  - a. Lick Creek
  - b. Bull Creek
  - c. Garden Creek
  - d. South Fork Pound River
  - e. North Fork Pound River
  - f. North Fork Powell River
  - g. Powell River
  - h. Indian Creek

# Tidewater Regional Office (TRO)

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1. **Tyson Foods Metal Translator Special Study:** In 2005 a special study was conducted by Tyson Foods Incorporated, Temperanceville Facility (Tyson) Accomack County, Virginia, Virginia Pollutant Discharge Elimination System (VDES) Permit #VA0004049. The purpose of the study was determine the ratio of total copper to dissolved copper in the wastewater treatment plant's final effluent. By determining the contribution of bioavailable copper (dissolved portion) the facility was seeking modification of its final effluent limit for copper.

Previous data collected by the facility and by the monitoring and assessment staff of VADEQ indicated that copper in the facilities effluent and in the receiving stream exceeded regulatory limits.

The facility discharges stormwater and treated wastewater via outfall 001 to an unnamed tributary to Sandy Bottom Branch. The unnamed tributary and Sandy Bottom Branch were listed as impaired for Aquatic Life Use due to exceedance of the freshwater acute criteria for copper and exhibits Observed Effects based on slightly impaired results from stream benthic biological monitoring. The Wildlife Use is impaired due to exceedance of the freshwater acute criteria for copper.

The special study was conducted in accordance with the Department of Environmental Quality (DEQ) Guidance Memorandum No. 96-009 Obtaining Dissolved Metals Data – Amendment #1 and with the Environmental Protection Agency (EPA) Office of Water document 823-B-96-007 The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion. The final report for this study was submitted in December 2005. The study demonstrated that 76% of the copper in the final effluent was bioavailable resulting in an adjustment to the permitted monthly and weekly average concentration.

2. **City of Franklin Waste Water Treatment Plant – Effects Ratio of Toxic Bioavailable Copper:** In 2006 a special study was initiated by the City of Franklin, Virginia, Virginia Pollutant Discharge Elimination System (VDES) Permit #VA0023922. The purpose of the study is to determine a water effects ratio for copper in the wastewater treatment plant's final effluent. By determining the effects ratio of toxic bioavailable copper (dissolved portion) the facility is seeking modification of its final effluent limit for copper. The water effects ratio is being developed in accordance with EPA 823-B-94-001, "Interim Guidance on Determination and Use of Water-Effect Ratios for Metals.

Previous data collected by the facility indicates that copper in the final effluent are exceeding regulatory limits. The study is still ongoing – results from sampling and analysis completed in the summer of 2006 are still not available.

# Valley Regional Office (VRO)

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1. **Collection and Analysis of Fish Tissue for Mercury Content - South River and South Fork Shenandoah River - Spring 2005.** This monitoring project is the continuation of an ongoing DEQ mercury-monitoring program. Results of this sampling effort are expected early in 2006. These data will be used to re-evaluate the existing consumption advisories on the South River (recommendation that no fish except stocked trout be eaten) and the South Fork Shenandoah River (recommendation of no more than 2 meals per month). These two rivers are sampled every 3 years under DEQ's long-term South River mercury monitoring program.

The South River and the South Fork of the Shenandoah River have been under fish consumption advisories since the 1970s, due to historic releases from the former DuPont manufacturing plant along the South River in Waynesboro, VA. Mercury was used at the plant from 1929 - 1950, and resulted in a legacy contamination problem that continues today. As part of DEQ's ongoing monitoring of fish tissue, samples were collected from a number of sites in 2005, with analyses completed in early 2006. Details can be found at

<http://www.deq.virginia.gov/fishtissue/mercury.html>.

Results from the 2005 fish collections were evaluated by the Virginia Department of Health and were the basis for continuing the existing consumption advisories. Details on these advisories can be found at

<http://www.vdh.virginia.gov/epi/publichealthtoxicology/ShenandoahRiver.asp>.

DEQ will be collecting fish tissue samples from these rivers again in 2007.

2. **Water Sample Collection and Analysis for Mercury in the South River and South Fork Shenandoah River, Virginia.** This monitoring project is also the continuation of an ongoing DEQ mercury-monitoring program. Mercury was released to the environment in the South River in Waynesboro during the first half of this century from a manufacturing process at the E.I. DuPont plant. In a 1982 settlement between DuPont and the State Water Control Board, a fund was established to support monitoring of water, sediments, and fish tissue in the river system for a projected 100-year period. Monitoring through the 1990s rarely detected measurable amounts of mercury in water, due to analytical constraints. With the development of more sensitive techniques ("clean" metals sampling and analyses), quantifiable levels are now routinely recorded. Since 2001, DEQ staff collects total and dissolved mercury samples from sites on the South River and South Fork Shenandoah River bimonthly.
3. **South River Science Team.** DEQ staff members are coordinating with members of the South River Science Team on a number of surveys in which data are gathered for water, sediments, floodplain soils, and biota in and along the South River. The South River Science team is comprised of representatives from industry, academic institutions, state and federal agencies, environmental groups and independent researchers. This group has met every two months for the past 5 years to coordinate efforts, collaborate on future work, and communicate results. Ongoing studies address mercury source identification, fate and transport, methylation processes, and ecological processes.
4. **South River Mercury TMDL.** DEQ has teamed with the United States Geological Survey (USGS) and Environmental Protection Agency (EPA) to conduct a Total Maximum Daily Load (TMDL) Study of mercury in the South River. This three-year project began in 2005 and will continue through 2008. The goals of the study are to quantify mercury sources in the watershed and to estimate the reductions from those sources that will be needed to decrease fish mercury levels to below the advisory level. As part of this study, USGS has established three continuous water quality monitoring stations, equipped for continuous monitoring of flow, temperature, dissolved oxygen, pH, turbidity, and conductivity. Routine base flow and storm flow water quality monitoring of total and dissolved mercury and methyl mercury also accompanies the continuous monitoring at these stations. This information will be used to establish loads and fluxes of mercury in the South River. With the help of the South River Science Team, USGS has also begun to quantify mercury sources in the watershed including base flow, storm flow, and groundwater loads from the former DuPont plant site, atmospheric loads, and floodplain soil loads.
5. **North and South Forks of Shenandoah River - Fish Kill Investigations.** For the past 3 springs (2004-2006), extensive fish kills have occurred in the Shenandoah River drainage. In 2004, the fish kills affected nearly the entire length of the North Fork of the Shenandoah River. In 2005, over 100 miles of the South Fork Shenandoah River were impacted. In 2006,

the fish kills returned to the North Fork Shenandoah, a portion of the South River, and the mainstem Shenandoah River. The Shenandoah fish kill events were preceded by a nearly identical fish kill in 2002 in WV's South Branch of the Potomac River. The fish kills in the North and South Forks of the Shenandoah River resulted in an estimated loss of 80% of the adult smallmouth bass and redbreast sunfish, both highly sought sport fish.

These fish kills are mysteries. Fish pathologists at USGS, Virginia Tech and the U.S. Fish & Wildlife Service determined that these fish were being stressed by undetermined factors and that the external bacterial lesions were apparently a secondary effect caused by stress. Review of historic water quality data has not indicated any notable changes in water quality in recent years or the presence of any chemicals at toxic levels. Traditional water quality sampling occurs only once per month and is insufficient to capture short-term environmental stresses that may occur, however. Much of the concern from citizens has focused on perceived impacts from agricultural, construction, and urban runoff.

To ensure a collaborative investigative and communication process, DEQ and the Virginia Department of Game & Inland Fisheries formed the Shenandoah River Fish Kill Task Force in July, 2005. The Task Force includes representatives of state and federal agencies, agriculture, industry, riparian landowners, anglers, academia, and citizen environmental groups from the Shenandoah Watershed. The Task Force has been meeting regularly since July 2005. The group has identified a number of hypotheses for the fish kills, along with strategies for investigating and validating possible causes. Recent collaborative efforts include participation with WV officials and USEPA in a CADDIS stressor identification workshop. DEQ is also contracting with regional fisheries experts to establish investigative priorities during 2007.

6. **Lewis Creek TMDL Toxics Study.** Lewis Creek in Staunton, Virginia, is on Virginia's 303d list of impaired waters for violation of the general aquatic life standard as assessed by benthic bioassessments. In previous sediment testing in Lewis Creek, mercury, chlordane, and five specific poly-aromatic hydrocarbon (PAH) compounds were found in concentrations above probable effect levels for aquatic organisms. As part of a Total Maximum Daily Load (TMDL) study to address the benthic impairment in Lewis Creek, DEQ has initiated additional testing of toxics in the water column and stream sediments. Base flow and storm flow samples from three monitoring locations were analyzed for toxic metals. Sediment from 13 monitoring stations on Lewis Creek and its tributaries were tested for mercury, PCBs, PAHs, organochlorine pesticides, and metals. Testing revealed PAH levels above probable effect levels for aquatic organisms at sites that have benthic impairments. Additional PAH testing at those sites was accompanied by sediment toxicity testing to determine if these sediments produce toxicity to benthic organisms. Following the conclusion of sediment testing, DEQ will conduct a stressor identification analysis and will develop a TMDL for the contaminant that is determined to be the most probable stressor.

This TMDL was completed and submitted to EPA in the spring of 2006.

# West Central Regional Office (WCRO)

## Regional Monitoring Coordinator

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### 1. Water column toxicity sampling for benthic TMDLs

**MY2005:** WCRO performed water column toxicity sampling for benthic TMDLs at two locations in the Jackson River in Allegany County. The Jackson River is a major tributary in the upper James River watershed. All samples were sent to the U.S. EPA laboratory in Wheeling, West Virginia. These samples showed potential toxicity concerns in the Jackson River and the results will be used when developing the Jackson River TMDL.

**MY2006:** WCRO performed water column toxicity sampling for benthic TMDLs at two locations in the Jackson River in Allegany County in MY 2005. The Jackson River is a major tributary in the upper James River watershed. All samples were sent to the U.S. EPA laboratory in Wheeling, West Virginia. These samples showed potential toxicity concerns in the Jackson River, but the developing TMDL will focus on nutrient reduction rather than toxicity.

2. **Smith River Biological TMDL:** WCRO performed toxicity testing in support of the Smith River biological TMDL in May 2006. All samples were sent to the U.S. EPA laboratory in Wheeling, West Virginia, but the results have not yet been received.
3. **Roanoke River TMDL (includes portions of South Central Region)** - A PCB TMDL study was initiated in 2005 to identify potential sources and determine the geographic distribution and severity of contamination from the upper reaches of the Roanoke River to Smith Mountain Lake, to the lower reaches from Leesville dam to the backwaters of Kerr Reservoir. The TMDL, which is scheduled for completion in 2008, is in response to PCB fish consumption advisories in the river. PCB sampling has included the use of semi-permeable membrane devices (SPMDs) deployed to help delineate sources of contamination. Ambient water samples were also collected at five stations, some co-located with USGS flow gages, during base and elevated flow conditions. These samples were analyzed using EPA Method 1668A which has high resolution-low detection level capabilities. Effluents from selected facility outfalls were also assessed for potential PCB loadings to the watershed using the low detection method. The PCB results are currently being reviewed. Another critical part of this source investigation entailed DEQ interviewing over 50 facilities in the upper Roanoke River basin from June to August 2005.

A descriptive sampling and analysis plan for this study, submitted by Tetra Tech, Inc. (Tetra Tech, 2005) is available on the DEQ WebPages at <http://www.deq.virginia.gov/tmdl/pptpdf/roansap1.pdf>. The results of this study, which will be available in spring 2007, shall provide information for future PCB sampling.

### 4. Roanoke (Staunton) River PCB TMDL Source Assessment

A PCB TMDL study was initiated in 2005 to identify potential sources and determine the geographic distribution and severity of contamination from the upper reaches of the Roanoke River to Smith Mountain Lake, to the lower reaches from Leesville dam to the backwaters of Kerr Reservoir. The TMDL, which is scheduled for completion in July 2006, is in response to PCB fish consumption advisories in the river. Sampling has included the use of twenty-five (25) semi-permeable membrane devices (SPMDs) deployed in areas that will help delineate sources of contamination. In addition, ambient water was collected at five USGS gauging stations during base flow conditions as well as elevated flows. These samples will be analyzed using EPA Method 1668a which has high resolution-low detection level capabilities. Effluents from selected facility outfalls shall also be assessed for potential PCB loadings to the watershed using the low detection method. Another critical part of this source investigation entailed DEQ interviewing over 50 facilities in the upper Roanoke River basin from June to August 2005.

A descriptive sampling and analysis plan for this study, submitted by Tetra Tech, Inc. (Tetra Tech, 2005) is available on the DEQ WebPages at <http://www.deq.virginia.gov/tmdl/pptpdf/roansap1.pdf>. The results of this study, which will be available in spring 2006, will provide information for future PCB sampling.



For additional information on toxics-related TMDLs in the West Central Region contact:

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